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ROLE OF RUSSIAN SCIENTISTS AND TECHNICIANS IN THE DEVELOPMENT OF THE ELECTROCHEMICAL INDUSTRY

N. P. Fedot'yev

/A Digest/

Before the revolution, the electrochemical industry in Russia was insignificant, and was financed by foreign capital.

Construction of a combustion element utilizing the oxidation of carbon (or some other fuel-like generator gas, CO, H_2, etc.) for the generation of an electromotive force was proposed for the first time in that period by P. I. Yablochkov (1884), who is also known for the invention of the electric lamp which bears his name (Yablochkov's electric candle).

While the idea of a combustion element was not favorably received in Yablochkov's time, work based on his ideas (he also devised a galvanic cell with a negative electrode made of sodium metal, thus obtaining an unprecedented EMF of 3.5 volts) has been resumed in the USSR at present. Results obtained at various institutes of the Academy of Sciences USSR have demonstrated the possibility of converting into electrical energy more than 80 percent of the free energy of fuels burnt up in specially constructed combustion elements.

In 1917, there were only three copper-refining plants, three plants for making storage batteries, and two chlorine-manufacturing plants. At the mint there was an electrolytic refining plant for precious metals. A small number of installations for electroplating was also available. But planning, construction, and application in these plants was the job of foreign specialists.

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A chair of electrochemistry was established at the Electrotechnical Institute in Petersburg in 1898, marking the beginning of electrochemical education if Russia. A number of famous electrochemists -- P. F. Antipin I. G. Shcherbakov, A. F. Alabyshev -- were students at this school. The first head of the chair was Prof N. Pushin, noted for his work in the study of the fusibility of the cryolite system.

The inauguration in 1904 of an electrochemical department in the Metallurgical Faculty of the Polytechnical Institute in Petersburg played an important role in the development of applied electrochemistry. Under the supervision of Prof Pavel Pavlovich Fedot'yev, the first training of Russian engineers and electrochemists began.

Fedot'yev is remembered for his activity in connection with aluminum and magnesium, and he figured in the establishment of the "Krasnyy Vyborzhets" Plant in Leningrad about 1929. Professors V. P. Il'inskiy, Antipin, Yu. V. Baymakov, V. M. Gus'kov, and V. P. Mashovets were contributors in this field also.

The Experimental Aluminum-Magnesium Plant, the State Institute of Applied Chemistry (GIPKh), the State Institute for the Planning of the Aluminum Industry, the All-Union Aluminum-Magnesium Institute, and a number of other institutes have done important work. Our aluminum and magnesium industries surpassed many foreign enterprises in World War II.

Development of the electrolytic production of nickel (a production which fully covers the needs of the Soviet Union), in connection with which the precious metals of the platinum group and cobalt compounds were also obtained, was due principally to the work of P. P. Fedot'yev, Prof N. P. Aseyev of the Leningrad Mining Institute, Prof Baymakov of the Leningrad Polytechnical Institute, Prof O. A. Yesin of the Ural Industrial Institute, Professors N. A. Fedot'yev, S. M. Chernobrov, and Ya. M. Pesin of the GIPKh, and B. V. Drozdov and A. A. Bulakh of the Union for Nickel and Tin Planning.

In 1934, one of the world's foremost electrolytic copper plants was established at Pyshminskiy, and two heavy-duty plants were also built to handle the zinc ore from the Urals and the Northern Caucasus. Contributors to the development of the zinc process were P. P. Fedot'yev, V. V. Stender, and S. A. Pletenev.

Electrolytic refining of lead was organized in 1940. Moreover, several new electrometallurgical processes were developed, e.g., the electrolytic preparation of pure manganese through the efforts of R. Agladze, S. Zaretskiy, and P. Zhivotinskiy on the basis of P. P. Fedot'yev's work.

Preparation of metallic powders in electrical engineering was developed by N. A. Izgaryshev; in 1943, hard and porous chromium plating was introduced by M. B. Cherkez and Antonov.

A number of new plants for the electrochemical preparation of chlorine and caustic soda was established in 1930, and an original Soviet chlorine cell was developed.

The Russian chlorine industry was developed by the GIPROKhIM and GIPKh with Professors V. A. Sass-Tisovskiy, Stender, V. G. Khomyakov, and L. S. Genin, V. B. Zhivotinskiy and I. S. Galinker among the foremost contributors.

Lachinov's idea for the electrolysis of water under pressure was studied in detail by Prof V. V. Ipat'yev and V. V. Shishkin. The original construction of a filter-press type cell for this process was made by Genin and co-workers from the State Institute of the Nitrogen Industry shortly before World War II.

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Professors Antipin, Alabyshev, and Galinker, and I. A. Tselikov were among those responsible for the development of industrial installations for the preparation of metallic sodium, a development of great significance.

The expansion of auto transportation and aviation necessitated the replacement of small production units of the storage battery industry, such as "Tyudor," "Reks," and "Tem," with the contemporary large plants. The new Podol'skiy Storage Battery Plant was established in 1935.

The manufacture of lead storage batteries is being expanded at present. B. A. Kosobryukhov, V. S. Lyzlov, T. N. Kalayda, S. Rozentsveyg, and other workers of the storage battery industry perfected a Soviet alkali storage battery. Several types of new high-quality galvanic cells, needed in great quantities for radio engineering, signaling, etc., were developed, and the production of active MnO_2 was introduced in that connection. S. S. Markov, V. S. Daniel'-Bek, and G. G. Morozov were among those who participated in these developments.

Valuable theoretical work on the improvement of chemical sources of current was done by Prof V. Ya. Kurbatov, and systematic work in this field was carried out by B. Kabanov and others of the Institute imeni Karpov under the supervision of Academician A. N. Frumkin.

Reconstruction of plants destroyed during the war has been successfully completed.

Experiences gained during the war are leading to the expansion of existing enterprises and the utilization of new processes.

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